

DOCUMENT RESUME

ED 263 832

HE 018 877

AUTHOR Brum, Joseph, Jr.
TITLE Effects of Computer-Assisted Instruction on Students' Final Grades. Applied Educational Research And Evaluation.
PUB DATE 18 May 83
NOTE 32p.; Doctoral Practicum Paper, Nova University.
PUB TYPE Dissertations/Theses - Practicum Papers (043) -- Reports - Research/Technical (143)
EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Business Administration Education; *College Instruction; College Students; Comparative Analysis; *Computer Assisted Instruction; *Grade Point Average; Higher Education; *Lecture Method; Teaching Methods; Technical Institutes
IDENTIFIERS *Fayetteville Technical Institute NC

ABSTRACT

The effect of computer-assisted instruction versus the traditional lecture method on final grades was compared with two groups of students taking two business organization classes at Fayetteville Technical Institute. Thirty-two students attended four 1-hour lectures per week (the control group), while 38 students received computer-assisted instruction for four 1-hour classes each week (the experimental group). The control group consisted of 17 freshmen and 15 sophomores, while the experimental group consisted of 23 freshmen and 15 sophomores. Both groups, who had the same instructor, were administered pre- and post-tests, which consisted of 25 multiple choice and 25 true and false statements that were selected from the instructor's manual. It was found that, on the average, students who received computer-assisted instruction achieved a significantly higher grade point average than students who received lecture material in the traditional manner. (SW)

* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *

ED263832

EFFECTS OF COMPUTER-ASSISTED INSTRUCTION
ON STUDENTS' FINAL GRADES

APPLIED EDUCATIONAL RESEARCH AND EVALUATION

by

Joseph Brum, M.B.A.

Fayetteville Technical Institute

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

☒ This document has been reproduced as
received from the person or organization
originating it.

☐ Minor changes have been made to improve
reproduction quality.

• Points of view or opinions stated in this docu-
ment do not necessarily represent official NIE
position or policy.

DR. BOYD AYERS

FORT BRAGG

"PERMISSION TO REPRODUCE THIS
MATERIAL HAS BEEN GRANTED BY

Joseph Brum

TO THE EDUCATIONAL RESOURCES
INFORMATION CENTER (ERIC)."

A PRACTICUM PRESENTED TO NOVA UNIVERSITY
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF DOCTOR OF EDUCATION

NOVA UNIVERSITY

May 18, 1983

HE 617 877

ABSTRACT

In the 1982-1983 winter quarter, two business organization classes were offered and taught by the same instructor. One class received lecture method in the traditional manner by attending four one-hour lectures each week. This group was designated the control group. The other class, known as the experimental group, received computer-assisted instruction by attending four one-hour classes each week in the computer lab. The nature of the problem is that business faculty members are concerned about which method of instruction would be most feasible, from the student's point of view, in teaching business organization classes at Fayetteville Technical Institute. The statement of the problem was as follows:

Do the students who receive computer-assisted instruction score significantly higher on final grades than do students who receive the traditional lecture method of instruction?

Results of the study showed that: (1) students who received computer-assisted instruction earned a significantly higher grade point average than students who receive lecture material in the traditional manner; and (2) attrition rates when compared to the departmental attrition rates were low for both classes. Attached appendixes provide the study data.

As a direct result of this study, the following recommendations were made:

(1) Replicate the study. This would provide an opportunity to further validate the findings.

(2) Determine students' attitudes toward the computer-assisted instructional methods.

(3) Further studies and experimentation in this area of instruction will be required.

TABLE OF CONTENTS

	Page
INTRODUCTION	1
STATEMENT OF THE PROBLEM	3
RESEARCH HYPOTHESIS.	3
BACKGROUND AND REVIEW OF LITERATURE.	3
LIMITATIONS OF THE STUDY	7
BASIC ASSUMPTIONS.	8
PROCEDURES FOR COLLECTING DATA	9
PROCEDURES FOR TREATING DATA	13
RESULTS AND FINDINGS	13
DISCUSSION, IMPLICATIONS, AND RECOMMENDATIONS.	16
REFERENCES	18
APPENDIXES	
A - Composition of Control and Experimental Classes	21
B - Analysis of Pre-Test and Post-Test Scores	23
C - Final Grade Distribution	25
D - Comparison of Attrition Between the Control and Experimental Classes	27

INTRODUCTION

The community college is that component of post secondary education which is most sensitive to the local community social structure and its divergent needs. The community college's open-door policy has invited an influx of "new" students into the classroom, many of whom exhibit a low basic skill in reading and mathematics. It behooves the community college, now more than ever before, to develop new instructional programs that are flexible enough to serve the community at large (Cross:1981).

Community college instructors, today, are advisors, facilitators, instructional managers, curriculum designers, academic instructors, and evaluators of instruction. They seek alternative methods to fulfill their duties as teachers and try to expand their ways to be meaningful to students. Drawing upon a variety of teaching models in order to combine these roles in a program that is enlightened, inspired, consistent, efficient, and effective, they master a repertoire of teaching approaches to use in carrying out their roles.

Different roles require different teaching strategies. In their three-volume "Models of Teaching" series, Weil and Joyce (1978) describe a number of models which incorporate teaching strategies based on defensible theories of human learning, growth, and development. According to their definition, "A model of teaching consists of guidelines for designing educational activities and environments. It specifies

ways of teaching and learning that are intended to achieve certain kinds of goals."

Community colleges, and higher education in general, in a time of financial crisis, seem to be faced with a major crisis. Our society is accepting more quickly than expected the process of being computerized. The miracle "chip" has made it possible for industry to provide personal or micro-computers for several hundreds of dollars that exceed the power of huge room-sized computers just fifteen years ago. Businesses, large and small, and individuals are buying these small computers by the thousands. This phenomena seems to be caused, in part, by people being convinced by the computer manufacturers that software package programs are available that will allow the average, non-technical person to keep a set of books, establish a computerized inventory system, produce letters and documents, and manage the affairs of everyday living.

A study by Damarian (1982) found that there has been a great deal of change in the role of technology in the schools. The advent of microcomputers has had an impact on instructional techniques as well as the development of interactive graphics and animation, and many other technologies such as videodisc and visical. Teacher educators face the responsibilities of preparing the teachers to teach students who will be living and working in the computer age.

STATEMENT OF THE PROBLEM

For the purpose of this practicum, the research question that was examined was as follows: Of all students enrolled in business organization classes, do the students who receive computer-assisted instruction score significantly higher on final grades than do students who receive the traditional lecture method of instruction?

RESEARCH HYPOTHESIS

In order to properly examine the research problem, a research hypothesis was formulated. The hypothesis for this problem was: Students who receive computer-assisted instruction score significantly higher on final grades than do students who receive the traditional lecture method of instruction.

BACKGROUND AND REVIEW OF LITERATURE

One of the major new themes in higher education is the expansion of computer science and its application in practically every field of endeavor. Understanding and knowing how to use a computer -- computer literacy -- has become a fact of life for millions of students entering institutions of higher education. Because of the increasing level of sophistication that students now bring to higher education, of the availability of computers at both the elementary and secondary levels, and because of the necessity

to integrate the use of computers in all disciplines, it is now imperative that the faculty, especially the older faculty, become more informed in the use of computers.

Almost every study finds that traditional instruction, supplemented by CAI, leads to higher achievement than traditional instruction alone. Studies conducted by Rapport and Savard (1980), failed to report a single case of contradictory findings. Even the extensive review by Thomas (1979) could only uncover one secondary typing course, one college accounting class, and one community college course where traditional instruction was found to be superior. All the elementary studies and virtually all the secondary studies report achievement gains by the students receiving CAI.

Studies of CAI as a replacement for traditional instruction are not as conclusive. Most of the studies reviewed by Edwards and her colleagues (1975) do not find CAI alone superior to traditional instruction alone. However, nearly half of the students do find higher achievement in the CAI group.

In attempting to formulate a working definition of computer-assisted instruction, it can be said that CAI is, fundamentally, the use of a computer, any type of computer, in enhancing the learning and mastery of a specific skill. CAI has long been utilized in scientific and technical fields; however, it is only within recent years that computerized instruction has been considered advantageous to the student learner. There can be little doubt that CAI is an idea

whose time has come. This fact is evidenced by a growing body of literature and increasing implementation of CAI on a practical level. John Allen of Dartmouth (Keohane, 1982), a pioneer in the CAI field, categorically states, "The use of a computer in helping teach students will increase in years to come: it has already been shown too effective to be ignored."

Some optimists see computers as slowly but surely bringing about many of the changes in schools long sought by educational reformers and concerned citizens. In this optimistic view, school people are beginning to take advantage of the power of the computer to make significant improvements in the conduct and effectiveness of the school. Computers are already beginning to free teachers from the drudgery of repetitive managerial tasks, so they can give their attention to the more personalized aspects of teaching. Many teachers are using computers to augment and make more effective their regular curriculum and methods.

Others in the educational community are far more sceptical about what will happen when computers go to school. They regard the optimistic vision described above as being naive about computers and about schools. They cite grave deficiencies in the current generation of computers -- machines that do not work properly and are hard to get serviced; computer programs that will not run on different machines even of the same make; the limited number of people who can use a small personal computer at the same time, and the high cost if large numbers of such computers must be purchased.

According to the sceptics, if teachers encounter such problems in their early experiences with computers, they will quickly sour on them and remain disenchanted for a long time to come, no matter how much computers are later improved. Many current studies have revealed that high achievement has been attained when utilizing the CAI method of instruction (Coburn:1982).

When thinking about general education, the question arises, "Are the general requirements the same today as they were twenty, fifty, or one hundred years ago?" Nannerl O. Keohane, President of Wellesly College, recently stated in the Chronicle of Higher Education, that the general education requirements of the 1980's will need to include a component she labeled "technological literacy"(Keohane:1982). Keohane, in her article, is arguing for more technological information to be included as a requirement for a good, solid education.

The technological advances in the field of micro-computers make it more critical than ever that all students and faculty understand the implications of computers and their impact on society.

The following quotes are a few examples from what is being written about this nation's most important component of our high technology industry, the microprocessor.

"As the dawn breaks, the computers will provide our lives in ways we are yet capable of imagining" (Long:1982).

"It was supposed to have been the atomic age, but it became the computer age" (Winkle:1982).

Sales of small computers are increasing at a rate of 50% to 60% a year. More than one million have already been bought, at prices ranging from \$500 to \$10,000. By 1985, small computers are expected to be a \$9 billion-a-year business (Taylor:1981).

New information technologies -- computers, micro-processors, video recording devices, and inexpensive means of storing and transmitting information -- are creating a revolution as important as the invention of printing (Meland:1982).

Over a decade ago, Alvin Toffler wrote Future Shock (1972) and we have been suffering from the phenomenon ever since -- a malady produced by a rapid rate of change. Through television, newspapers, magazines, and advertising, we are aware of an excess of potentially life-changing developments. Yet none of these changes seem more apparent today than the effect of the computer. Today, readily available and less expensive microcomputer and communications technologies can place programmed instruction directly into the hands of instructors. Almost every study finds that traditional instruction, supplemented by CAI, leads to higher grades than traditional instruction alone.

LIMITATIONS OF THE STUDY

(1) This study is limited to a comparison of only two business organization classes: one class received computer-assisted instruction versus the second class which received the traditional lecture method of instruction.

(2) Only end-of-course grades were compared in the two classes.

(3) No attempt was made to determine why students withdrew.

(4) No analysis was made of the differences in student environmental background.

(5) Implications gained through information attained from this study may only have value to the Business Administration and Economics Department staff at Fayetteville Technical Institute.

BASIC ASSUMPTIONS

(1) The two classes, one business organization class which received computer-assisted instruction, and the second class, which received the traditional method of instruction, are reasonably homogeneous.

(2) The same teacher for both classes provided equal learning opportunities for all students.

(3) The two classes involved in this study each had a normal distribution of intelligence.

(4) The students in both classes had equal opportunity to achieve certain grades.

(5) The students in both groups are characteristic of a sampling of community college students.

PROCEDURES FOR COLLECTING DATA

For this study, a classroom experiment strategy was used to facilitate the evaluation of the effectiveness of audio-visual aided instruction as it would occur in an actual classroom setting. The experiment was conducted in the Department of Business and Economics at Fayetteville Technical Institute, a two-year community college located in Fayetteville, North Carolina.

In the 1982-1983 winter quarter, two business organization classes were offered and taught by the same instructor. One class received the traditional lecture method of instruction by attending four one-hour lectures each week. The thirty-two (32) students in this class were known as the control group. Thirty-eight (38) students in the other class were known as the experimental group. This group received computer-assisted instruction. The experimental and control groups received a pre-test at the beginning of the experiment and a post-test at the conclusion. The mean scores on the pre-test and post-test results for matching students was compared. At the conclusion of the experiment, a comparison was made of the grade point averages to determine if there was any significant difference between the two groups.

Subjects for the study were not randomly selected on an individual basis, but were selected as a group. Since this course consisted of two class sections (one

morning and one afternoon), the morning class was randomly selected as the control group, while the afternoon class was designated as the experimental group. An assumption was made that students in both groups were characteristic of a representative sampling of community college students.

The experimental group consisted initially of thirty-eight students (seventeen females and twenty-one males), while the control group consisted of thirty-two students (thirteen females and nineteen males) (see Appendix A). The mean age of the experimental group was 22.7 years, while it was 26.0 years for the control group. However, at the conclusion of the experiment, usable data was obtained from only thirty-five and twenty-eight of the experimental and control groups, respectively. Since matched test scores were necessary to conduct a student t-test, not all participants received both the pre-test and the post-test, resulting in the aforementioned figures.

Material used in the lectures for both groups was taken primarily from the course textbook, Contemporary Business, by Louis E. Boone and David L. Kurtz (1982). Although some supplemental references were utilized, the majority of material was taken from the textbook.

Although some may consider the chalkboard a visual aid, this study has not made such a presumption. Chalkboards have been utilized in conjunction with traditional forms of instruction. In this study, chalk

boards were available and were used during presentations to both groups.

Lesson plans were formulated for each instructional period to insure that the main objective of each class lecture was accomplished. During the experiment, the lesson plans proved to be an invaluable means for managing classroom instruction.

During the first instructional period, students in both the experimental and control groups were administered a pre-test. The pre-test consisted of fifty items, to include twenty-five multiple choice and twenty-five true and false statements. The same statements were rearranged and administered as a post-test at the conclusion of the experiment. In preparing the test that had been utilized as a pre-test and post-test, questions were selected from the instructor's manual, which accompanied the course textbook. Questions were selected which were representative of the material covered throughout the experiment. An assumption was made that the measurement instrument (pre-test and post-test), which would be used to test the students, was based on an interval means of measurement. An interval means of measurement was essential since this study was intended to analyze the eventual grade point averages utilizing the student t-test.

After the pre-test was administered, the student answer sheets were graded and the results retained for

later analysis. It should be noted that students used IBM (mechanically graded) answer sheets during the pre-test and post-test. Since the grading of these tests were mechanical, student answer sheets were spot checked to insure correct grading by the machine.

The pre-test results were not shown to the students until after the completion of the experiment. These procedures were adopted for several reasons. First, in adherence with principle of "ceteris paribus", it was felt that to inform the students of their pre-test results may create additional factors which could influence the final results. For example, a student who was informed that he received a very low pre-test score may be motivated to a high degree to improve his performance. If he were to score high on the post-test, his performance would be attributed to his increased motivation and not to the use of computer-assisted instruction. Undoubtedly, such a situation would create a dilemma when interpreting the results of the study.

During the last instructional period, both groups were administered a post-test. As noted earlier, the post-test was nothing more than a rearrangement of the questions utilized in the pre-test. Also, it was assumed that the maturation process would not affect the post-test scores. Since the students again utilized a machine graded IBM answer sheet, the completed answer sheets were spot checked to insure correct grading by the machine.

PROCEDURES FOR TREATING DATA

Once the data had been assembled and difference in grade point averages noted, the averages were submitted to a t-test to determine the significance between the means of the samples. The null hypothesis tested was: There is no significant difference between the final grade mean score of students receiving computer-assisted instruction and those students receiving traditional lecture methods of instruction. The hypothesis was tested at the .05 level of significance, utilizing the degrees of freedom available, which were sixty-eight, $H_0: E = C$. The alternative hypothesis is $H_a: E \neq C$.

RESULTS AND FINDINGS

The random sampling technique that was used in the investigation included a total of seventy (70) students that were studied. The experimental group consisted of twenty-three (23) freshmen and fifteen (15) sophomores, of which twenty-one (21) students were males and the remaining seventeen (17) were females. The control group consisted of seventeen (17) freshmen and fifteen (15) sophomores with nineteen (19) of the students being males and the remaining thirteen (13) students females.

The group that received computer-assisted instruction by attending four one-hour classes in the computer

lab was found to have a mean score of 2.87 and a standard deviation of .78. The group that received course material in the traditional manner by attending four one-hour lectures each week was found to have a mean score of 2.42 and a standard deviation of 0.65. This showed a mean score difference of .45.

An analysis of the data was then performed to determine if this difference was significant. An independent t-test for testing the significance of the difference between two independent sample means was used for the analysis. The desired level of significance was established at .05. The degrees of freedom were calculated. Since the experimental group contained thirty-five (35) scores, and the control group also contained thirty-five (35) scores, the degrees of freedom were calculated to be sixty-eight. Next, the critical t value was established. By referring to a table of critical t values, it was found that for sixty-eight degrees of freedom, the critical t value at the .05 level of significance was 1.99 for a two-tailed test. The standard procedure for t-testing was then employed. When the calculations were completed, the calculated t value was found to be 2.50. Since the calculated value of t did exceed the critical value of t, the null hypothesis that there is no significant difference between the final grade mean score of students receiving a computer-assisted instruction class

and those students who did not receive computer-assisted instruction was rejected.

This study revealed that experiences in mean scores on the pre-tests and post-tests between the experimental and control groups in the 1982-1983 winter quarter were significant at the .05 level of significance.

In the pre-test exercise, there was no significant difference in mean scores between the control and experimental groups. The standard deviation was fairly close and the student t-test value for the pre-test exercise was 1.29. In the pre-test results there was a significant difference in mean scores between the control and experimental groups. The difference in the t-test value was computed to be 6.03. Statistical analysis of the results of this test are reported in Appendix B. Since there is a significant difference in the student's post-test mean scores, it can be concluded that students who receive computer-assisted instruction will earn higher end-of-course grades than students who did not receive computer-assisted instruction.

The significant difference in the final grades was the distribution of A's and B's. In both cases, approximately 20% more students in the experimental group received A's and B's, than students in the control group (see Appendix C).

The attrition rates of both groups were also compared, but since they were significantly low, they had little effect on the final results. In the process of

comparing semester attrition rates, it was determined that the number of students withdrawing from the course did so before the first test (see Appendix D).

Although this study did corroborate some of the findings of earlier studies, observations made during the study did provide some interesting findings. For example, class attentiveness was much greater in the experimental group than in the control group during class presentations. In addition, class discussion and participation were much greater in the experimental group than in the control group. With the use of computers, a greater amount of material was covered with the experimental group in a shorter period of time than in the control group, where a chalkboard was utilized. This provided the opportunity for additional class discussion. Finally, students in the experimental group appeared to take more class notes than students in the control group.

DISCUSSION, IMPLICATIONS, AND RECOMMENDATIONS

An analysis of the data obtained from this investigation rejected the null hypothesis. This indicates that students who received computer-assisted instruction will normally earn a higher grade point average than a student who has received traditional lecture practice methods.

As a direct result of this study, the following recommendations were made:

(1) Continue to explore new and better ways of presenting a business organization class to college students.

(2) Search for additional ways to personalize instruction. Computer-assisted instructional methods and materials used alone tend to impersonalize the learning environment.

(3) Provide alternative instructional programs in the business organization classes for different types of students. Possibly through early testing, students could be programmed into a class that would have the most learning potential for them. Some students prefer a highly structural course, and others may perform better in an audio-tutorial or some other non-traditional program.

This study provides a base for future studies and experimentation in the area of instructional methods. Results clearly indicate that computer-assisted instructional methods are effective. It is hoped that new imaginative instructional strategies will more perfectly meet the needs of students in the years ahead.

REFERENCES

- Boone, Louis E., and David L. Kurtz. Contemporary Business, The Dryden Press, New York, 1982.
- Coburn, Peter, Peter Kelman, Nancy Roberts, Thomas Snyder, Daniel Watt, and Cheryl Weinger. Practical Guide to Computers in Education. Addison-Wesley Publishing Co., Inc., Reading, MS, 1982.
- Cross, P. K. Adults as Learners. San Francisco, CA: Jossey-Bass, Inc., 1981.
- Damarin, Suzanne F. Technology in the Classroom: Initiative or Response? New Directions in Curriculum Development. February 1982, ED 213476.
- Edwards, J., S. Norton, S. Tailor, M. Weise, and R. Van Dusseldorf. "How Effective is CAI? A Review of the Research." Educational Leadership, 1975, 33, 147-153.
- Keohane, Linda. Chronicle of Higher Education. February 10, 1982.
- Long, Sandra M. "The Dawning of the Computer Age: An Interview with Ronald Palamora." Phi Delta Kappan, January 1982.
- Meland, Arthur S. "Information Technology for U.S. Schools." Phi Delta Kappan, January 1982.
- Rapport, P., and W. G. Savard. Computer-Assisted Instruction. Research on School Effectiveness Project: Topic Summary Report. "Paper presented for the Alaska Department of Education", Juneau, Alaska.
- Taylor, Alexander. "Small-Computer Shortout." Time, March 2, 1981.
- Thomas, D. B. "The Effectiveness of Computer-Assisted Instruction in Secondary Schools." AEDS Journal, 1979.
- Toffler, Alvin. Future Shock. New York: Random House, 1972.
- Weil, Marsha, and Bruce Joyce. Information Processing Models of Teaching. Englewood Cliffs, NJ, Prentice-Hall, 1978.

Winkle, Linda W., and Walter M. Mathews. "Computer Equity Comes of Age." Phi Delta Kappan, January 1982.

APPENDIX A

Composition of Control and Experimental Classes

	<u>Experimental</u>		<u>Control</u>	
	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>
Freshmen	24	63	19	59
Sophomores	14	37	13	41
Males	21	55	19	59
Females	17	45	13	41

APPENDIX B

ANALYSIS OF PRE-TEST AND POST-TEST SCORES

PRE-TEST

	n	$\bar{X}$	SD	t-test Value
Control Group	32	45.20	7.70	1.29
Experimental Group	38	47.66	8.70	

POST-TEST

	N	$\bar{X}$	SD	t-test Value
Control Group	28	76.66	16.41	6.03
Experimental Group	35	82.69	16.49	

APPENDIX C

Final Grade Distribution

<u>Class</u>	<u>Number</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>WD</u>
Experimental	35	11	16	5	0	3
Percent		31%	46%	14%	0%	9%
Control	28	3	8	9	4	4
		11%	29%	32%	14%	14%

APPENDIX D

Comparison of Attrition Between the
Control and Experimental Classes

Class	Students Starting Class	Withdrawals	Percentage of Attrition
Control Group	32	4	10%
Experimental Group	38	3	8%

The attrition rates of the above two groups were compared to the Business Administration Department attrition rates (17%) for the 1982-1983 winter quarter. The attrition rates were low in both classes. There are no significant differences between the two groups.